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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Ng, Paul Tat-Keung
Serial No.	:	09/579,973
Filed	:	May 26, 2000
For	:	METHOD AND APPARATUS FOR QUICK STARTING A ROPE-START TWO-STROKE ENGINE
Group Art No.	:	3747
Examiner	:	Dolinar, Andrew M.

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Commissioner for Patents
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APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 1.191 AND 1.192

Dear Sir:

This Appeal Brief is being filed in furtherance to the Notice of Appeal mailed to the U.S. Patent & Trademark Office on April 19, 2003.

1. REAL PARTY IN INTEREST

The real party in interest is Bombardier Motor Corporation of America, the Assignee of the above-referenced application by virtue of an Assignment from Outboard Marine Corporation to Bombardier Motor Corporation of America.

2. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellant's legal representative in this Appeal. Bombardier Motor Corporation of America, the Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

3. STATUS OF THE CLAIMS

Claims 1-40 and 42-53 are currently pending. Claims 1, 7-14, 21-24, and 26-36 are currently under final rejection and, thus, are the subject of this appeal. Claims 15-20, 40, and 42-53 are allowed, claims 2-6, 25, and 37-39 are objected to but would be allowable if rewritten in independent form with all intervening limitations, and claim 41 has been cancelled. Therefore, claims 2-6, 15-20, 25, 37-53 are not the subject of this appeal and are outside the scope of this appeal.

4. STATUS OF AMENDMENTS

The Appellant is submitting an amendment herewith and subsequent to the Final Office Action mailed on November 19, 2002. In proofreading the claims, Appellant has found typographical errors in claims 15, 52, and 53 and has amended claims 15, 52, and 53 to correct these errors.

5. SUMMARY OF THE INVENTION AND OF THE DISCLOSED EMBODIMENTS

"The present invention relates generally to two-stroke engines and, more particularly, relates to a method and apparatus for starting a rope-start, two-stroke engine." *Application*, pg. 1, lns. 1-2.

According to the present invention, "the period required to start a rope-start, two-cycle engine is reduced by enabling the engine's firing sequence immediately upon determining the absolute rotational position of the engine and before determining the engine's direction of rotation." *Id.* pg. 5, lns. 1-5. Once the rotational direction of the engine is determined, the firing sequence is disabled if the engine is counter-rotating. *Id.* pg. 5, lns. 5-6. In this manner, the firing sequence is enabled much sooner in the engine's operational cycle than if the engine's rotational direction were determined before the firing sequence were enabled. *Id.* pg. 5, lns. 6-8. Absolute engine rotational position and engine rotational direction may be sensed by detecting and identifying indexing markers on a rotational component of the engine and determining the sequence in which the indexing markers are detected. *Id.* pg. 5, lns. 9-12. The indexing markers may, for instance, comprise magnetic markers (i.e., teeth or other markers made of a magnetically conductive material such as steel) that are located on the engine's flywheel or crankshaft and that are capable of being detected by a magnetic pick-up device, in which case the detector preferably comprises a magnetic pick-up device located adjacent the rotating component. *Id.* pg. 5, lns. 12-16.

In accordance with one aspect of the invention, a two-stroke engine is provided with improved quick start capability. *Id.* pg. 6, lns. 1-2. The engine includes a manually-powered starter, a monitor, an electrically powered device which controls at least one aspect of an engine's firing operation, and a computer. *Id.* pg. 6, lns. 2-4. The starter typically comprises a pull-rope coupled to the engine's flywheel. *Id.* pg. 6, lns. 4-5. The monitor comprises a pick-up device or other detector that detects magnetic teeth or other markers on a rotational component of the engine such as a flywheel or a crankshaft. *Id.* pg. 6, lns. 5-7. The powered device may comprise the engine's fuel injection system and/or its ignition system or components of those systems. *Id.* pg. 6, lns. 7-8. The computer is operable, in conjunction with the monitor, to determine an absolute rotational position of the monitored component (and hence the engine as a whole) and to enable the supply of energizing current to the powered device. *Id.* pg. 6, lns. 9-11. Then, after enabling the supply of energizing current to the powered component, the computer determines the rotational direction of the monitored component and disables the supply of energizing current to the powered device if it determines that the monitored component is counter-rotating. *Id.* pg. 6, lns. 11-15.

Preferably, the monitored component bears first and second angularly-spaced indexing markers, and the monitor includes a detector that is configured to detect passage of

the first and second indexing markers. *Id.* pg. 6, lns. 16-18. The computer is configured to determine an angular spacing between the first and second indexing markers and to identify the second detected indexing marker and, hence, determine the absolute rotational position of the engine based upon this determination. *Id.* pg. 6, lns. 18-21. In order to permit the rotational direction of the engine to be determined, the monitored component preferably bears a third indexing marker that is angularly-spaced from both the first indexing marker and the second indexing marker. *Id.* pg. 6, ln. 21 to pg. 7, ln. 1. The computer is configured to identify the third detected indexing marker and determine the sequence of passage of the second and third detected indexing markers based upon this identification. *Id.* pg. 7, lns. 1-3.

6. **ISSUES**

Whether claims 1, 7-14, 21-24 and 26-36 are unpatentable under 35 U.S.C. §103(a) over Krueger in view of Tobinaga et al.

7. **GROUPING OF CLAIMS**

The Examiner has provided a single ground of rejection which Appellant contests. The pending rejected claims do all stand or fall together.

8. **ARGUMENT**

The Examiner rejected independent claims 1, 21, and 34 under 35 U.S.C. §103(a) as being unpatentable over Krueger in view of Tobinaga et al. Included in each of the independent claims is the specific order of enabling engine firing and then, if reverse rotation is determined, disabling engine firing. That is, the current invention allows the engine to be started and then, after engine firing has already begun, the rotational direction of the rotational component is determined. Due to the possibility of reverse rotation of the rotational component, reverse running will be permitted for a short time. Simply, by allowing quick starting of the engine and waiting to determine the rotational direction of the rotational component until after the engine is firing actually permits reverse running. However, the dangers of short term reverse running are tolerated in order to facilitate a faster and easier engine startup. Furthermore, the dangers of reverse running are minimized by the novel ability to determine absolute rotational position in less than a single revolution of the rotational component after generating sufficient power to energize the control system and the

ability to quickly determine the direction of rotation after the engine is running to disable the firing sequence if the flywheel is turning in reverse.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. MPEP §2142. To establish a *prima facie* case, the Examiner must show (I) there is a suggestion, or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or combine the reference teachings, (II) a reasonable expectation of success, and (III) the references must teach or suggest all the claim limitations. MPEP §2142. As will be explained, the Examiner has failed to provide the requisite (I) motivation to combine, not shown a (II) reasonable likelihood of success, and failed to show that (III) each and every claimed limitation is either taught or suggested.

Lack of Motivation to Combine

To establish a *prima facie* case of obviousness, "there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." MPEP §2143.

The claimed invention reduces the period, and therefore the effort, required to start a rope-start, two-cycle engine by enabling the engine's firing sequence immediately upon determining the absolute rotational position of the engine and before determining the engine's direction of rotation. The present invention balances a tradeoff between allowing engine startup immediately with preventing reverse running of the engine, which can cause subsequent damage. The present invention does so to enable consistent startup upon a single rope pull. This tradeoff, according to the present invention, is that Appellant actually allows the engine to start regardless of the direction of rotation. In other words, the engine is actually allowed to start in reverse direction, and after the engine is allowed to start, if it is found that the engine is running in reverse, the firing sequence is disabled thereby quickly turning the engine off.

Krueger is specifically directed to a rope-start engine system not having a battery. Appellant believes that one of ordinary skill in the art, looking to improve the ease of starting a rope-start engine without a battery, would not consider a reference directed to an electric-start engine because electric-start engines are generally not concerned with starting as quickly as possible, at the expense of some other criteria for a number of reasons. For one, an

electric-start engine does not require a manual rope-start. Understandably, one skilled in the art will readily recognize that the need to reduce the physical effort in starting a rope-start engine is markedly different than any perceived need to quicken startup of an electric-start engine since the effort needed to manually start an engine with a rope is nowhere near equivalent to the power used in an electric-start engine or the effort required in pushing a button or turning a key. For this reason alone, it is not realistic to combine these two references.

Additionally, one skilled in the art will also readily recognize that upon activating the electrical system in an electric-start engine (such as turning on the key) immediately supplies power to various components, including the ECU to control ignition timing. On the other hand, an engine that does not have a battery, and is not electric-start, requires a period of engine rotation to generate sufficient power to energize the control system. Therefore, when looking to improve the starting efficiency of a manual-start engine, one of ordinary skill in the art would not consider Tobinaga et al. because it is directed to an electric-start engine and does not suggest or consider the problems associated with manual-start engines.

Even assuming that one might be motivated to combine the electric-start engine taught by Tobinaga et al. with the manual-start engine of Kreuger, such a combination would not only <u>not</u> render the present claims obvious, it could not result in a system such as that claimed. That is, one skilled in the art combining Kreuger with Tobinaga et al., without using the improper hindsight of the present invention, would end up with one of two possibilities. First, and most logically, the combination might result in an electric-start engine, which quite clearly would not render the present claims obvious, or, alternatively, a manual-start engine that, if at all, implements the reverse "prevention" system of Tobinaga et al. That is, Tobinaga et al. is directed toward "preventing" reverse running. As will be described in detail hereinafter, Tobinaga et al. does not enable engine firing before determining rotational direction. For if it did, such would not be a "prevention" of reverse running.

MPEP §2142 also provides that the requisite motivation is lacking if the proposed motivation would render the prior art unsatisfactory for its intended purpose. The claimed invention explicitly permits reverse rotation of the engine to allow the engine to start within as minimal as less than a single revolution after power-up. The claimed invention also allows the engine to fire and then, after the engine is firing, determines the rotational direction of the

engine and disables the engine if it is determined to be running in a reverse direction. Tobinaga et al. is explicit that reversing is to be prevented. Col. 16, lns. 23-25. Therefore, the combination of Krueger and Tobinaga et al. must be modified to operate as the Examiner asserts. Simply, the reference must be modified in a manner that contradicts its intended purpose. That is, Tobinaga et al. must be changed from "preventing" to "allowing" to operate as the Examiner asserts. However, nowhere in the references is it taught or suggested to allow reversing and then, if detected, stopping the engine. Such a system is inconsistent with the teachings of Tobinaga et al.

Additionally, one of ordinary skill in the art would not be inclined to modify Tobinaga et al. to allow reversing because of the known dangers of reversing. Appellant's Specification is clear that reversing is undesirable "[b]ecause counter-rotation risks damage to the engine and possibly components powered by it." *Appellant's Specification*, pg. 3, lns. 13-14. However, the current invention considers these dangers and, in an effort to improve the starting efficiency of a manual-start engine, allows reverse running until the determination of the rotational direction is made. The claimed invention makes a decided trade-off between the dangers of allowing reversing and improving the ease of start-up. However, when considering Tobinaga et al. such a trade-off does not exist.

Since Tobinaga et al. is directed to an electric-start engine, the benefits of improving the ease of start-up are negated because a battery bears the burden of supplying the start-up power rather than an individual. Therefore, when considering Tobinaga et al., one of ordinary skill in the art would not be motivated to modify the system of Tobinaga et al. to allow reversing because such is typically undesirable and improving the ease of start-up is unnecessary in an electric-start system. The Examiner has not provided any reference or otherwise to support the identified modifications. Accordingly, Appellant believes the claimed invention is patentably distinct.

Reasonable Expectation of Success

The second prong of a test for *prima facie* obviousness requires that the Examiner show at least a reasonable expectation of success if the references are modified or combined in a manner suggested by the Examiner. Further, whether the proposed modification or combination of the prior art has a reasonable expectation of success is determined at the time the invention was made. As such, the reference themselves, rather than Appellant's

specification, must provide evidence suggesting a modification would be successful. Relative to the art applied by the Examiner in the present case, it is clear the Examiner has failed to provide evidence suggesting that the proposed modification of Kreuger and Tobinaga et al. would be successful.

As will be described in greater detail below, Tobinaga et al. is directed to a battery-powered engine that prevents reverse running of the engine's rotation component, i.e. flywheel. In this regard, Tobinaga et al. teaches a reverse running prevention scheme wherein a series of pulses generated by magnets passing pulser coils are received and evaluated to determine if the flywheel is rotating in a reverse direction. If a reverse running condition is detected and the engine is in condition to fire, a misfire ignition timing control is initiated preventing the engine from starting. Col. 16, lns. 23-43.

In contrast, the present invention is directed to a rope-start engine wherein reverse running of a rotation component is permitted, albeit for a short duration. Specifically, the engine is allowed to start and if it is determined that the rotational direction of the flywheel or other monitored component is running in a reverse direction, the engine is disabled. As such, the present invention permits the starting of an engine if the engine's flywheel or other monitored component is running in a reverse direction.

In light of that which is presently claimed and that taught by Tobinaga et al., it is clear that the Examiner's proposed modification to Tobinaga et al. lacks a reasonable expectation of success. Simply put, Tobinaga et al. prevents reverse rotation of a flywheel whereas the present invention accommodates the reverse rotation of an engine's flywheel. Accordingly, there is simply no reasonable expectation of success that the reverse running prevention scheme taught by Tobinaga et al. could be modified to permit the reverse rotation of the engine flywheel, without the improper use of hindsight.

<u>Failure to Teach Each and Every Claim Element</u>

Independent Claim 1

Appellant believes the Examiner has underappreciated the distinctions of the present invention over the prior art and the importance of the sequence of events that is required and, as a result, continued a rejection that is improper. Specifically, the Examiner contends:

> Krueger discloses an electronic engine control system for ignition and fuel injection in a rope-start engine without a battery which may be used in a snowmobile but does not determine reverse running and disable the firing sequence in a two stroke engine. Tobinaga et al teaches that it is known to determine reverse running and disable the firing sequence in a two stroke engine. Rotational position is determined as set forth at column 5, lines 56-61. Reverse running determination and disabling of the firing sequence is described at column 16, lines 23-43. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electronic engine control system of Krueger for use in a two stroke engine and to include a reverse running disabling feature, as taught by Tobinaga et al, in order to provide an operative engine and to prevent damage to the engine. The resulting control system would *inherently* perform the method of claims 1 and 7-14 and would *inherently* function as specified by claims 21-24 and 26-35. It would have been an obvious matter of design choice to include a computer in the electronic control unit per claim 36.

Office Action of May 31, 2002, pg. 2 (emphasis added).

In the Response of September 3, 2002, Appellant explained:

> [T]he Examiner argued that the claims were rejected on a basis of inherency, that is, the prior art "inherently" taught what was purported in the above independent claims. Applicant respectfully disagrees with this assertion. In order to determine obviousness, through inherency or not, "the test is whether the combined teachings of the prior art, taken as a whole, would have rendered the claimed invention obvious to one of ordinary skill in the art." *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995). However, the prior art cited by the Examiner does not disclose or give structure to support an obviousness rejection nor does it inherently or implicitly purport to do so.

Response of September 3, 2002, pg. 3-4.

As stated, claim 1 is clear that engine firing is enabled, <u>then</u> rotational direction of the rotational component is determined, and <u>then</u> engine firing is disabled if reverse rotation is determined. The use of the word "then" cannot be overlooked. This claim calls for the engine to begin firing <u>before</u> any rotational direction determination is made. Therefore, claim 1 actually calls for <u>allowing</u> reverse running, albeit for a short period. On the other hand, Tobinaga et al. is clear that "reverse prevention control [is] performed by the controller 29." Col. 16, lns 24-25. "Prevent" is defined as "[t]o keep from happening; avert." *See* The American Heritage Dictionary (2nd Ed.), p. 982 (enclosed herewith). Therefore, Tobinaga et al. is clear that reverse running is <u>not</u> allowed to happen and thus must be averted.

However, the Examiner contends that "[w]hen reverse rotation is not detected by the reverse prevention program, the ignition system of Tobinaga et al operates 'to **continue** ordinary ignition timing control' (column 16, lines 39-40)." Office Action of November 19, 2002, pg 4. Furthermore, the Examiner states that "[t]his implies that ignition has already started when the reverse rotation interruption occurs." *Id.* However, the Examiner is clearly misinterpreting that which is taught. Actually, this does not teach that the ignition has already started the engine, because it clearly states that it continues ordinary ignition timing control. Continuing ordinary engine control does not mean that the engine has been allowed to start. It merely means that the control algorithm is allowed to continue.

As stated, Tobinaga et al. is clear that reverse running is prevented. The Examiner is misinterpreting the statement that "[i]f the result of judgment in the step (45) is YES, the ignition timing 30 confirms that the engine 11 is operating in the forward direction in a step (47) and the process to the step (45) to *continue ordinary ignition timing control*." Col. 16, lns. 36-40 (emphasis added). The Examiner has misinterpreted the statement to imply that the engine is already firing and the engine firing, not the igniting timing control, is permitted to "continue." However, the statement teaches continuing ordinary ignition timing control, not continuing engine firing. The cited section simply teaches that ignition timing control is not changed to misfire which would cause the engine to misfire when the engine does, later, attempt to fire. Col. 16, lns. 27-40. One skilled in the art would readily acknowledge as much as it would not make sense for an electric-start engine to be allowed to start in reverse, and then disable it. Such an interpretation can only be had after reading the present application, which is clearly improper use of hindsight.

The Examiner's misunderstanding stems from straying from that which is explicitly taught when combining the references. That is, Tobinaga et al. teaches a battery-powered engine startup. Col. 5, lns. 19-26. Therefore, the system of Tobinaga et al. teaches that when a power switch initiates startup, the internal battery serves to power a starter, which powers the flywheel. *Id.* One of ordinary skill in the art will readily recognize that Tobinaga et al.'s reverse prevention control will finish an evaluation of the order of the pulse sequence prior to the engine starting. *See* Tobinaga et al., col. 16, lns. 23-43. Tobinaga et al. explains that the "pulses" are received and evaluated to ensure they are in the correct order. Col. 16, lns. 29-31. If they are not in the correct order, "the ignition timing means 30 operates not to transmit the ignition timings for all cylinders to the ignition signal generating means 31 and effects a

misfiring control..." Col. 16, lns. 32-35. From this statement alone, it is clear that Tobinaga et al. does not enable ignition signals before it is determined that the pulses P_1 to P_6 are in the "correct order." Col. 6, lns. 29-31. However, Tobinaga et al. proceeds to explain that if the pulses P_1 to P_6 are in the correct order "the ignition timing 30 confirms that the engine 11 is operating in the forward direction", the process continues to "ordinary ignition timing control." Col. 16, lns. 37-40. So if the pulses P_1 to P_6 are <u>not</u> in the correct order, the ignition timing means 30 operates "not to transmit the ignition timings", and if the pulses P_1 to P_6 are in the correct order, ordinary ignition timing <u>control</u> is allowed to proceed. The interpretation that Tobinaga et al. does not allow starting in reverse, is confirmed by Tobinaga et al. in the very next line in which Tobinaga et al. states "therefore, according to the reverse ***prevention*** control by the controller 29, it is possible to ***prevent*** accidental reversing of the engine..." Col. 16, lns. 40-42 (emphasis added). Even ignoring the aforementioned logic of Tobinaga et al., it is clear that the use of "prevention" and the use of "to prevent accidental reversing" does not support actual ignition and engine startup before determining the direction of the engine rotation.

This point cannot be overemphasized. Tobinaga et al. is explicit that reverse running is <u>prevented</u>. Col. 16, lns. 23-25. Nowhere does Tobinaga et al. teach or suggest anything but prevention. Therefore, it is clear that the art of record teaches only <u>prevention</u> of reverse running and does not teach allowing the engine to start and then stopping the engine if it is running in reverse.

Additionally, Appellant has set forth in previous responses other grounds for distinguishing claim 1 over this cited combination. For example, Appellant has argued at length that Tobinaga et al. does not teach, or suggest determining absolute rotational position within a time as minimal as less than a single revolution of the engine after generating sufficient power to energize the control system. This element is completely absent for at least the reason that Tobinaga et al. does not generate power to energize the control system because Tobinaga et al. is an electric-start engine system. As stated, Appellant has previously argued other distinctions; however, in the interest of brevity, Appellant is confident in relying on the aforementioned argument that Tobinaga et al. is directed solely at "preventing" reverse running and the present claim actually enables engine firing before any determination of rotational direction. This strikes at the heart of the invention and is clearly a distinguishing characteristic.

Accordingly, Appellant believes claim 1 is patentably distinct over the cited reference. Furthermore, Appellant believes claims 7-14 are in condition for allowance at least pursuant to the chain of dependency.

Independent Claim 21

The Examiner failed to provide an independent basis of rejection for claim 21, other then that which was addressed with respect to claim 1. As such, Appellant incorporates herein the relevant remarks, set forth above with respect to claim 1.

Specifically, claim 21, in part, calls for a computer that (1) determines an absolute rotational position of a component and (2) enables a supply of energizing current to the powered device upon determining the absolute rotational position. Then, (3) based on continued monitoring of the rotation of the component after the absolute rotational position of the component has been determined, the computer determines whether the component is rotating in a forward direction or a reverse direction. The computer then (4) disables the supply of energizing current to the power device if it is determined that the component is running in the reverse direction. Additionally, claim 21, is clear that "acts (1) and (2) are carried out during a single actuation of the manually-powered starter, and acts (3) and (4) are carried out after the engine has been allowed to start." There is no teaching or suggestion by Krueger or Tobinaga et al. that the determination of an absolute rotational position of the rotational component and the supplying of energizing current to the powered device upon determining the absolute rotational position of the component are carried out during a single actuation of the manually-powered starter. Therefore, the Examiner has failed to show that the combination teaches each and every element of the claim and also has not provided a convincing line of reasoning as to why one of ordinary skill in the art would have found the invention obvious in light of the references.

Furthermore, there is no teaching or suggestion by Krueger or Tobinaga et al. that the determination of rotational direction of the component and then the disabling of the supplied current if the component is running in a reverse direction are carried out after the engine has been allowed to start. As previously stated, the combination actually teaches away from allowing the engine to start prior to determining the rotational direction of the component. That is, Tobinaga et al. teaches reverse rotation is prevented, col. 16, lns. 23-43; whereas claim 21 calls for allowing engine start-up regardless of direction and then disables the engine if it is later determined to be running in reverse. In contrast, Tobinaga et al. teaches that the engine is prevented in the first instance from running if the rotational component is determined to be turning in reverse. Accordingly, no "convincing line of reasoning as to why

the artisan would have found the claimed invention to have been obvious in light of the teachings of the references" can be shown because the references actually teach away from such. MPEP §2142

For all of the reasons stated above, Appellant believes claim 21 is patentably distinct over the cited reference.

Claims Dependent on Claim 21

Appellant believes claims 22-24 and 26-33 are each in condition for allowance at least pursuant to the chain of dependency. Furthermore, Appellant notes that claims 22-24 and 26 contain elements substantially similar to the elements of claims 2-4 and 6 respectively. The Examiner indicated the allowabiltiy of claims 2-4 and 6 but rejected claims 22-24 and 26 without explanation. Appellant believes that claims 22-24 and 26, like claims 2-4 and 6, clearly contain allowable subject matter

Independent Claim 34

The Examiner failed to provide an independent basis of rejection for claim 34, other than that which was addressed with respect to claim 1. As such, Appellant incorporates herein the relevant remarks with respect to claim 1.

However, the Examiner did recognize that "[c]laim 34 appears to fall under the scope of 35 U.S.C. 112, 6th paragraph, but stated that the arguments provide no reasons why the applicant believes the prior art element should not be considered an equivalent to the specific structure, material or acts disclosed in the specification." Office Action of November 19, 2002, pg. 4. Appellant believes this statement is indicative of the Examiner's failure to properly consider Appellant's remarks.

The Examiner refers Appellant to MPEP §2184, however, this section is only applicable after a *prima facie* case of obviousness is made by showing equivalence between the claimed means and those taught by the art of record. Appellant contends that no *prima facie* case of obviousness was ever made. Further, Appellant believes that the Examiner did not properly considered the Appellant's remarks of September 3, 2002.

Specifically, to establish a case of *prima facie* obviousness, the Examiner must not only show that the reference teaches or suggests each and every element of the claimed invention, but also provide "a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references."

MPEP §2142. Appellant believes that such was not provided, as set forth in the remarks of September 3, 2002 and the above remarks with respect to claims 1 and 21.

That is, Tobinaga et al. clearly teaches that the engine is prevented from running if it is determined that the rotational component is rotating in reverse. *See* Col. 16, lns. 40-43. However, claim 34 calls for enabling the engine firing sequence and then disabling it if is later determined that the rotational component is rotating in reverse. Accordingly, Tobinaga et al. teaches away from the claimed invention of allowing reverse rotation and then stopping the engine when reverse rotation is determined by instead teaching preventing the engine to start running if reverse rotation is determined.

Additionally, claim 34 calls for a "means for enabling an engine firing sequence upon determining the absolute rotational position of the component during a single operation of the means for driving a rotational component of the engine." Simply, claim 34 calls for the engine firing to be dependent upon the determination of absolute rotational position within a specified period. Tobinaga et al. makes no such teaching or suggestion. While Tobinaga et al. does teach determining rotational position for synchronizing the timing of the ignition signal with the rotation of the crankshaft, it does not teach or suggest that which is specifically called for in claim 34.

As such, the Examiner has failed to show that the art of record teaches or suggests each and every element of the claim. Therefore, claim 34 is patentably distinct from the art of record.

Nevertheless, assuming arguendo that a *prima facie* case was established, Appellant believes that (1) the teaching of Appellant's specification show that the art of record is not equivalent, and (2) the teachings of the prior art reference itself tend to show nonequivalence. First, Appellant's specification is clear that a means for determining an absolute rotational position is a single detector that senses the passing of multiple evenly and unevenly spaced markers. *See* Appellant's Specification, pg. 5, lns. 6-12 and pg. 6, ln. 16 to pg. 7, ln. 3. Furthermore, Appellant's specification is clear that a means for determining a rotational direction of the component is the detector and markers used to determine absolute rotational position. *Id.* Nowhere in the references are such means, as taught by Appellant's specification, disclosed. Tobinaga et al. uses a series of pulser coils and uses those pulser coils in a substantially different manner.

One of ordinary skill in the art will readily recognize that a single detector that senses the passing of multiple evenly and unevenly spaced markers is not equivalent to a crank angle signal generator together with a plurality of magnets and pulser coils. Additionally, Tobinaga et al. teaches that the means for preventing reverse operation is a reverse prevention control to judge "whether the output pulses P_1 to P_6 from the pulser coils 32 corresponding to respective cylinders are in correct order." Col. 16, lns. 29-31. Again, one of ordinary skill in the art will readily recognize the control that senses the passing of multiple evenly and unevenly spaced markers is not equivalent to reverse prevention control to judge "whether the output pulses P_1 to P_6 from the pulser coils 32 corresponding to respective cylinders are in correct order." *Id.* Accordingly, Appellant believes that the burden of proving nonequivalence has been met and claim 34 is patentably distinct from the art of record.

For all of the above reasons, Appellant believes claim 34 is patentably distinct from the art of record for including elements not taught or suggested by the art of record. Additionally, Appellant believes that claim 34 contains structures, materials and acts that are not equivalent to those of the art of record. Additionally, Appellant believes claims 35 and 36 are in condition for allowance at least pursuant to the chain of dependency.

<u>**Tobinaga et al. Requires Modification to Match the Examiner's Assertions**</u>

The claimed invention explicitly permits reverse rotation of the engine to allow the engine to start within as little as less than a single rope pull. The claimed invention also allows the engine to fire and then, after the engine is firing, determines the rotational direction of the engine and disables the engine if it is determined to be running in a reverse direction. Tobinaga et al. is explicit that reverse running is to be <u>prevented</u>. Col. 16, lns. 23-25. Therefore, the combination of Krueger and Tobinaga et al. must be modified to operate as the Examiner asserts. That is, the Tobinaga et al. must be changed from "preventing," to "allowing" in order to operate as the Examiner asserts. However, nowhere in the references is it taught or suggested to <u>allow</u> reversing and then, if detected, stopping the engine. Such a system is inconsistent with the teachings of Tobinaga et al.

Additionally, one of ordinary skill in the art would not be inclined to modify Tobinaga et al. to allow reversing because of the known dangers of reversing. Appellant's Specification is clear that reversing is undesirable "[b]ecause counter-rotation risks damage

to the engine and possibly components powered by it." *Appellant's Specification*, pg. 3, lns. 13-14. However, the current invention considers these dangers and, in an effort to improve the starting efficiency of a manual-start engine, allows reverse running until the determination of the rotational direction is made. The claimed invention makes a decided trade-off between the dangers of allowing reversing and improving the ease of start-up. However, when considering Tobinaga et al. such a trade-off does not exist.

Since Tobinaga et al. is directed to an electric-start engine, the benefits achieved by Appellant's tradeoff are negated because a battery bears the burden of supplying the start-up power rather than an individual. Therefore, when considering Tobinaga et al., one of ordinary skill in the art would not be motivated to modify the system of Tobinaga et al. to allow reversing because such is typically undesirable and improving the ease of start-up is not as critical as it is in a manual starting system. The Examiner has not provided any reference or otherwise to support the identified modifications. Accordingly, Appellant believes the claimed invention is patentably distinct.

9. CONCLUSION

In view of the above remarks, Appellant respectfully submits that the Examiner has provided no supportable position or evidence that the claims 1, 7-14, 21-24 and 26-36 are obvious under §103(a). The Examiner has failed to provide the requisite motivation to combine Krueger with Tobinaga et al. Additionally, the Examiner has failed to show that the combination is workable and teaches each and every element of claims 1, 7-14, 21-24 and 26-36. Finally, the Examiner has failed to provide a reference or basis for modifying Tobinaga et al. such that the combination would operate as the Examiner asserts. Accordingly, Appellant respectfully requests that the Board find claims 1, 7-14, 21-24 and 26-36 patentable over the prior art of record and withdraw all outstanding rejections.

General Authorization for Extension of Time

In accordance with 37 C.F.R. §1.136, Appellant hereby provides a general authorization to treat this and any future reply requiring an extension of time as incorporating a request therefore. Furthermore, Appellant authorizes the Commissioner to charge any overpayments or underpayments to deposit account no. 15-0777 the appropriate fee for an extension of time or any other fee which may be currently due. A

copy of the Credit Card payment form in the amount of $320.00 fee for filing this Appeal Brief under 37 C.F.R. §1.17(c) is enclosed (originally filed with original Appeal Brief on May 19, 2003).

Respectfully submitted,

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Attorney Docket No.: **Old:** OMC1159.009
New: BMCA9159.009

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APPENDIX OF CLAIMS ON APPEAL

In the Claims

1. (Amended – Under Appeal) A method of starting a two-stroke engine comprising:

(A) manually driving a rotational component of the engine to rotate and provide power to a control system;

(B) determining an absolute rotational position of the component within a time as minimal as less than a single revolution of the engine after generating sufficient power to energize the control system;

(C) enabling an engine firing sequence upon determining the absolute rotational position of the component to start the engine upon a single performance of step (A); then

(D) determining a rotational direction of the component based on continued monitoring of the rotation of the component; and then

(E) disabling the engine firing sequence if is determined in step (D) that the component is running in a reverse direction.

2. (Allowable) The method as in claim 1, wherein the step of determining the absolute rotational position of the component comprises detecting rotation of first and second angularly-spaced indexing markers on the component past a detector and identifying the second detected indexing marker.

3. (Allowable) The method as in claim 2, wherein the step of determining the rotational direction of the engine comprises detecting rotation of a third indexing marker on the component past the detector and identifying the third indexing marker.

4. (Allowable) The method as in claim 3, wherein the determining step comprises determining a sequence that the identified indexing markers are detected.

5. (Allowable) The method as in claim 4, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the step of determining the sequence that the identified indexing markers are detected comprises counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

6. (Allowable) The method as in claim 2, wherein the markers are magnetic markers, and wherein the detecting step comprises detecting rotation of the magnetic markers past a magnetic pick-up device located adjacent the component.

7. (Amended – Under Appeal) The method as in claim 1, wherein the enabling step comprises enabling the supply of energizing current to at least one of an electronic fuel injection system of the engine and an electronic ignition system of the engine.

8. (Amended – Under Appeal) The method as in claim 1, wherein the engine is a battery-less engine which generates electricity to run the engine from rotation thereof, and further comprising beginning to generate electrical power immediately upon manually driving the component to rotate, and wherein the engine rotates at least one revolution after initiation of the manually driving step before generating enough power to run the engine.

9. (Amended – Under Appeal) The method as in claim 8, wherein the manually driving step drives the engine to rotate through no more than five revolutions.

10. (Amended – Under Appeal) The method as in claim 9, wherein the manually driving step drives the engine to rotate through no more than three revolutions.

11. (Amended – Under Appeal) The method as in claim 8, wherein the engine is a snowmobile engine.

12. (Amended – Under Appeal) The method as in claim 1, wherein the manually driving step comprises manually pulling a rope-start mechanism.

13. (Amended – Under Appeal) The method as in claim 1, wherein the rotational component is a flywheel of the engine.

14. (Amended – Under Appeal) The method as in claim 1, wherein the engine is a snowmobile engine.

15. (Allowed) A method of starting a two-stroke battery-less engine, comprising:

(A) driving a rotational component of the engine to rotate by manually actuating a rope-start mechanism to provide power to a control system and thereafter:

(B) detecting rotation of the component through first and second rotational positions thereof;

(C) determining, based on the detecting step, an absolute rotational position of the component, the determining step occurring before the component rotates more than 270°; then

(D) enabling an engine firing sequence immediately upon determining the absolute rotational position of the engine, the enabling step comprising enabling the supply of energizing current to at least one of am electronic injection system of the engine and an electronic ignition system of the engine; then

(E) detecting rotation of the component through a third position which is angularly spaced unequally from the first position and from the second position; then

(F) determining, based on the step (E), whether the component is rotating in a forward direction or a reverse direction; and

(F) disabling the engine firing sequence if it is determined in step (F) that the engine is running in the reverse direction.

16 (Allowed) The method as in claim 15, wherein the detecting steps comprise detecting rotation of first, second, and third indexing markers on the component past a detector located adjacent the component and identifying at least the second and third indexing markers.

17. (Allowed) The method as in claim 16, wherein the determining step (D) comprises determining a sequence that the identified markers are detected.

18. (Allowed) The method as in claim 17, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing, β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the step of determining the sequence that the identified markers are detected comprises counting the number of additional markers between the first and second indexing markers and the second and third indexing markers.

19. (Allowed) The method as in claim 15, wherein the engine rotates at least one revolution after initiation of the driving step before generating enough power to run the engine.

20. (Allowed) The method as in claim 19, wherein the driving step drives the engine to rotate through no more than three revolutions.

21. (Amended – Under Appeal) A two-stroke engine comprising:

a manually-powered starter which, when actuated, drives a rotational component of the engine to rotate and power a control, the control including:

(A) a monitor which monitors rotation of the rotational component;

(B) an electrically powered device which, when energized, affects at least one aspect of an engine firing operation;

(C) a computer which is coupled to the monitor and to the powered device and which is operable, in conjunction with the monitor and the powered device, to:

(1) determine an absolute rotational position of the component,

(2) enable a supply of energizing current to the powered device upon determining the absolute rotational position of the component,

(3) determine, based on continued monitoring of the rotation of the component after the absolute rotational position of the component has been determined, whether the component is rotating in a forward direction or a reverse direction,

(4) disable the supply of energizing current to the powered device if it is determined that the component is running in the reverse direction; and

(5) wherein acts (1) and (2) are carried out during a single actuation of the manually-powered starter, and acts (3) and (4) are carried out after the engine has been allowed to start.

22. (Amended – Under Appeal) The engine as in claim 21, wherein the component has first and second angularly-spaced indexing markers thereon, wherein the monitor includes a detector which is configured to detect movement of the first and second indexing markers therepast, and wherein the computer is configured to identify the second detected indexing marker.

23. (Amended – Under Appeal) The engine as in claim 22, wherein the component has a third indexing marker thereon which is angularly spaced from the first indexing marker and the second indexing marker, wherein the detector is configured to detect movement of the first and second indexing markers therepast, and wherein the computer is configured to identify the third detected indexing marker.

24. (Amended – Under Appeal) The engine as in claim 23, wherein the computer is configured to determine a sequence that the identified indexing markers are detected.

25. (Allowable) The engine as in claim 24, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, and wherein the computer is configured to determine the sequence that the identified indexing markers are detected by counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

26. (Amended – Under Appeal) The engine as in claim 22, wherein the markers are magnetic markers, and wherein the detector comprises a magnetic pick-up device located adjacent the component.

27. (Amended – Under Appeal) The engine as in claim 21, wherein the powered device comprises at least one of an electronic injection system and an electronic ignition system.

28. (Amended – Under Appeal) The engine as in claim 27, wherein the engine is a battery-less engine which generates electricity to run the engine from rotation thereof.

29. (Amended – Under Appeal) The engine as in claim 28, wherein the manually actuated starter is capable of driving the engine to rotate through no more than five revolutions.

30. (Amended – Under Appeal) The engine as in claim 21, wherein the engine is a snowmobile engine.

31. (Amended – Under Appeal) The engine as in claim 21, wherein the manually actuated starter comprises a rope-start mechanism.

32. (Amended – Under Appeal) The engine as in claim 21, wherein the rotational component is a flywheel of the engine.

33. (Amended – Under Appeal) A snowmobile incorporating the engine of claim 21.

34. (Amended – Under Appeal) A two-stroke engine comprising:

(A) means, responsive to a manually-input force, for driving a rotational component of the engine to rotate;

(B) means for determining an absolute rotational position of the component during a single operation of the means for driving a rotational component of the engine;

(C) means for enabling an engine firing sequence upon determining the absolute rotational position of the component during a single operation of the means for driving a rotational component of the engine;

(D) means for determining a rotational direction of the component based on continued monitoring of the rotation of the component after the absolute rotational position of the component is determined; and

(E) means for disabling the engine firing sequence if the means for determining the rotational direction of the component determines that the component is running in a reverse direction.

35. (Amended – Under Appeal) The engine as in claim 34, wherein the means (A) comprises a rope-start mechanism.

36. (Amended – Under Appeal) The engine as in claim 34, wherein the means (B) through (E) include a computer.

37. (Allowable) The engine as in claim 34, wherein the means (B) comprises means for detecting rotation of first and second indexing markers on the component past a designated position and determining an angular spacing between the first and second markers.

38. (Allowable) The engine as in claim 37, wherein the means (D) includes means for detecting rotation of a third indexing marker on the component past the designated position and determining a sequence that the identified indexing markers are detected.

39. (Allowable) The engine as in claim 38, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the means (D) comprises means for counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

40. (Allowed) A signal generating apparatus of an engine comprising:

a plurality of indicator markers spaced apart from one another and positioned about a periphery of a rotational component;

a plurality of indexing markers spaced apart from one another and positioned about the periphery of a rotational component;

wherein the plurality of indexing markers is less in number than that of the plurality of indicator markers and where the plurality of indexing markers are unequally spaced apart;

a detection apparatus to detect movement of the indexing and indicator marks and enable an engine to start after detecting rotational position regardless of rotational direction; and

at least three indexing markers wherein a second indexing marker is located at a first angular spacing α from a first indexing marker and a second angular spacing β from a third indexing marker, where α is not equal to β.

41. (Cancelled).

42. (Allowed) The signal generating apparatus of claim 40 wherein the plurality of indicating markers are equally spaced apart.

43. (Allowed) The signal generating apparatus of claim 40 further comprising a rotatable flywheel having the signal generating apparatus mounted thereto.

44. (Allowed) The signal generating apparatus of claim 43 further comprising a detector mounted stationary with regard to the rotatable flywheel and arranged to detect a passage of each indicator marker and indexing marker as the rotatable flywheel rotates about the detector.

45. (Allowed) The signal generating apparatus of claim 43 further comprising:

a manual, battery-less start mechanism to start an engine and rotate the rotatable flywheel; and

a control system connected to receive signals from the detector and responsive thereto:

determine an absolute rotational position of the rotatable flywheel based on two of the indexing markers during a single pull of the manual, battery-less start mechanism;

enable an engine firing sequence upon the single pull of the manual, battery-less start mechanism;

determine rotational direction of the rotatable flywheel; and

disable the engine firing sequence if it is determined that the rotational direction is in a reverse direction.

46. (Allowed) The signal generating apparatus of claim 42 further comprising a memory unit having stored therein a set of numbers indicative of the plurality of equally spaced indicating markers that are located between each unequally spaced indexing marker.

47. (Allowed) The signal generating apparatus of claim 46 further comprising a control system capable of differentiating between the unequally spaced indexing markers based on the number of equally spaced indicating markers therebetween.

48. (Allowed) A method of manufacturing a two-stroke engine to enable starting in a single manual pull comprising:

providing a manually driven two-stroke engine, which upon manual rotation of the engine, an alternator provides power to a control system of the engine;

arranging a plurality of indicator markers in a spaced apart relation on a rotational component of the engine;

arranging a plurality of indexing markers about the plurality of indicating markers such that a number of indicating markers between each two indexing markers are unequal for determining an absolute rotational position of the rotational component; and

upon determining the absolute rotational position of the component, enabling engine firing regardless of rotational direction, all during a single manual pull of the manually driven two-stroke engine.

49. (Allowed) The method of claim 48 wherein the arrangement allows for determining a rotational direction of the rotational component based on continued monitoring of the rotation of the rotational component, and disabling the engine firing sequence if it is determined that the component is running in a reverse direction.

50. (Allowed) A method of starting a two-stroke engine comprising:

(A) manually driving a rotational component of the engine to rotate;

(B) determining an absolute rotational position of the component;

C) enabling an engine firing sequence upon determining the absolute rotational position of the component; then

(D) determining a rotational direction of the component based on continued monitoring of the rotation of the component; and then

(E) disabling the engine firing sequence if is determined in step (D) that the component is running in a reverse direction;

wherein the step of determining the absolute rotational position of the component comprises detecting rotation of first and second angularly-spaced indexing markers on the component past a detector and identifying the second detected indexing marker and detecting rotation of a third indexing marker on the component past the detector and identifying the third indexing marker and determining a sequence that the identified indexing markers are detected; and

wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the step of determining the sequence that the identified indexing markers are detected comprises counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

51. (Allowed) A method of starting a two-stroke battery-less engine, comprising:

(A) driving a rotational component of the engine to rotate by manually actuating a rope-start mechanism, the component comprising one of a crankshaft and a flywheel;

(B) detecting rotation of the component through first and second rotational positions thereof;

(C) determining, based on the detecting step, an absolute rotational position of the component, the determining step occurring before the component rotates more than 270°; then

(D) enabling an engine firing sequence immediately upon determining the absolute rotational position of the engine, the enabling step comprising enabling the supply of energizing current to at least one of am electronic injection system of the engine and an electronic ignition system of the engine; then

(E) detecting rotation of the component through a third position which is angularly spaced unequally from the first position and from the second position; then

(F) determining, based on the step (E), whether the component is rotating in a forward direction or a reverse direction;

(G) disabling the engine firing sequence if it is determined in step (F) that the engine is running in the reverse direction;

wherein the detecting steps comprise detecting rotation of first, second, and third indexing markers on the component past a detector located adjacent the component and identifying at least the second and third indexing markers;

wherein the determining step (D) comprises determining a sequence that the identified markers are detected; and

wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing, β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the step of determining the sequence that the identified markers are detected comprises counting the number of additional markers between the first and second indexing markers and the second and third indexing markers.

52. (Allowed) A two-stroke engine comprising:

(A) a manually-powered starter which, when actuated, drives a rotational component of the engine to rotate;

(B) a monitor which monitors rotation of the rotational component;

(C) an electrically powered device which, when energized, affects at least one aspect of an engine firing operation; and

(D) a computer which is coupled to the monitor and to the powered device and which is operable, in conjunction with the monitor and the powered device, to:

(1) determine am absolute rotational position of the component,

(2) enable a supply of energizing current to the powered device upon determining the absolute rotational position of the component,

(3) determine, based on continued monitoring of the rotation of the component after the absolute rotational position of the component has been determined, whether the component is rotating in a forward direction or a reverse direction, and

(4) disable the supply of energizing current to the powered device if it is determined that the component is running in the reverse direction;

wherein the component has first, second, and third angularly-spaced indexing markers thereon, wherein the monitor includes a detector which is configured to detect movement of the first, second, and third indexing markers therepast, and wherein the computer is configured to identify the second and third detected indexing marker and wherein the computer is configured to determine a sequence that the identified indexing markers are detected; and

wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, and wherein the computer is configured to determine the sequence that the identified indexing markers are detected by counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

53. (Allowed) A two-stroke engine comprising:

(A) means, responsive to a manually-input force, for driving a rotational component of the engine to rotate;

(B) means for determining an absolute rotational position of the component;

(C) means for enabling an engine firing sequence upon determining the absolute rotational position of the component;

(D) means for determining a rotational direction of the component based on continued monitoring of the rotation of the component after the absolute rotational position of the component is determined;

(E) means for disabling the engine firing sequence if the means for determining the rotational direction of the component determines that that the component is running in a reverse direction;

wherein the means (B) comprises means for detecting rotation of first and second indexing markers on the component past a designated position and determining an angular spacing between the first and second markers;

wherein the means (D) includes means for detecting rotation of a third indexing marker on the component past the designated position and determining a sequence that the identified indexing markers are detected; and

wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the means (D) comprises means for counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.